

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

COPY #7

In Re Application of:

Hirst, et al.

Serial No.: 09/819,925

Filed: March 28, 2001

For: Fusing System Including an External Heater)

Group Art Unit: 2852

Examiner: Tran, Hoan H.

Docket No.: 10004411-1

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postage prepaid, in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231, on July 12, 2002.

Mary Meegan
Signature - Mary Meegan

DECLARATION OF B. MARK HIRST PURSUANT TO 37 C.F.R. §1.131

Commissioner of Patents
Washington, D.C. 20231

Sir,

I, B. Mark Hirst, hereby declare that:

1) The invention embodied in the above-identified patent application is directed to fusing systems and devices that incorporate such fusing systems.

2) I am advised that the United States Patent and Trademark Office has rejected one or more claims presently pending in the above-identified patent application based, at least in part, upon United States Patent No. 6,304,741 to *Tange*. I am further advised that the effective filing date of the *Tange* patent is July 10, 2000.

3) The invention, however, as embodied in the claims of the present invention was completed by myself and my co-inventors in this country prior to July 10, 2000. Specifically, the invention was "completed" by virtue of reduction to practice prior to the July 10, 2000 filing date of the *Tange* patent.

4) As evidence that the present invention was so characterized by reduction to practice, Exhibit "A" is attached hereto.

5) Exhibit "A" is a copy of notebook entries from my notebook number 4276. As indicated on pages 37-42 of this notebook, an embodiment of the claimed invention was made and tested with positive results. All of these activities occurred prior to the July 10, 2000 critical date. Note that all dates contained on pages 37-42 have been redacted.

I hereby declare that all statements made herein are of my own knowledge are true and that all statements are made on information and belief and are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

July 2, 2002
Date

B. Mark Hirst
B. Mark Hirst

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Hirst, et al.

Serial No.: 09/819,925

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Mary Meegan
Signature - Mary Meegan

DECLARATION OF KENNETH E. HEATH PURSUANT TO 37 C.F.R. §1.131

Commissioner of Patents
Washington, D.C. 20231

Sir,

I, **Kenneth E. Heath**, hereby declare that:

1) The invention embodied in the above-identified patent application is directed to fusing systems and devices that incorporate such fusing systems.

2) I am advised that the United States Patent and Trademark Office has rejected one or more claims presently pending in the above-identified patent application based, at least in part, upon United States Patent No. 6,304,741 to *Tange*. I am further advised that the effective filing date of the *Tange* patent is July 10, 2000.

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4) As evidence that the present invention was so characterized by reduction to practice, Exhibit "A" is attached hereto.

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July 2, 2002
Date

Kenneth E. Heath
Kenneth E. Heath

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:)

Hirst, et al.)

Serial No.: 09/819,925)

Filed: March 28, 2001)

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Examiner: Tran, Hoan H.

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Mary Meegan
Signature - Mary Meegan

DECLARATION OF MARK WIBBELS PURSUANT TO 37 C.F.R. §1.131

Commissioner of Patents
Washington, D.C. 20231

Sir,

I, Mark Wibbels, hereby declare that:

1) The invention embodied in the above-identified patent application is directed to fusing systems and devices that incorporate such fusing systems.

2) I am advised that the United States Patent and Trademark Office has rejected one or more claims presently pending in the above-identified patent application based, at least in part, upon United States Patent No. 6,304,741 to *Tange*. I am further advised that the effective filing date of the *Tange* patent is July 10, 2000.

3) The invention, however, as embodied in the claims of the present invention was completed by myself and my co-inventors in this country prior to July 10, 2000. Specifically, the invention was "completed" by virtue of reduction to practice prior to the July 10, 2000 filing date of the *Tange* patent.

4) As evidence that the present invention was so characterized by reduction to practice, Exhibit "A" is attached hereto.

5) Exhibit "A" is a copy of notebook entries from Mark Hirst's notebook number 4276. As indicated on pages 37-42 of this notebook, an embodiment of the claimed invention was made and tested with positive results. All of these activities occurred prior to the July 10, 2000 critical date. Note that all dates contained on pages 37-42 have been redacted.

I hereby declare that all statements made herein are of my own knowledge are true and that all statements are made on information and belief and are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

7-2-02
Date


Mark Wibbels

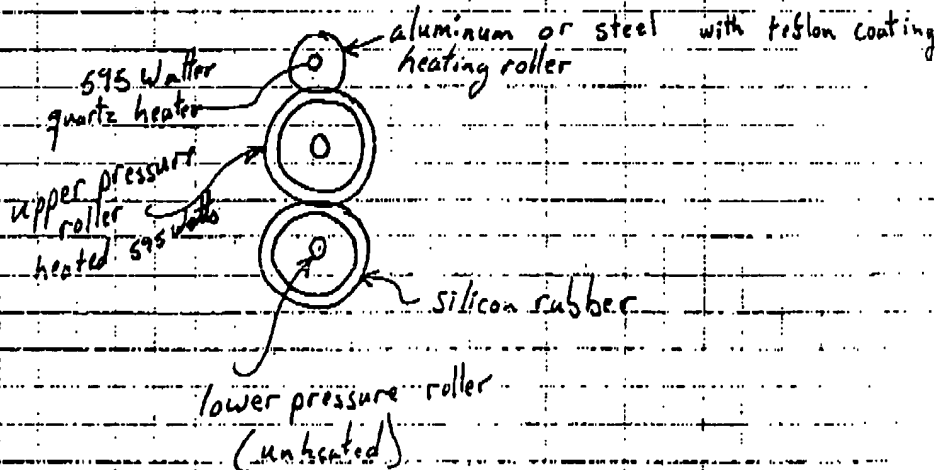
EXHIBIT "A"

Project No. _____

TITLE Fusing Sys. w/ external heating roller No. _____

From Page No. _____

Present two roller fusing systems utilize aluminum rollers which are typically covered by a thick layer (4mm) of silicon rubber to maximize the width of the nip area for improved fusing. The silicon rubber is a poor thermal conductor which results in a fusing system which requires an excessive amount of time to bring to working temperature. For example, the HP 8500 laser printer requires 4 minutes & 20 seconds to achieve a working temperature of 180°C with two heated rollers each heated by 595 Watt quartz lamps. ^(190 watts) Using an external heated metal roller eliminates a great portion of the thermal time delay in the sys. The following system was prototyped with 2 595 heater lamps:



This system reduced warm up time to 2 minutes & 30 seconds from 23°C to 180°C .

To Page No. _____

Witnessed & Understood by me, _____

Date _____

Invented by _____

Date _____

Recorded by _____

38

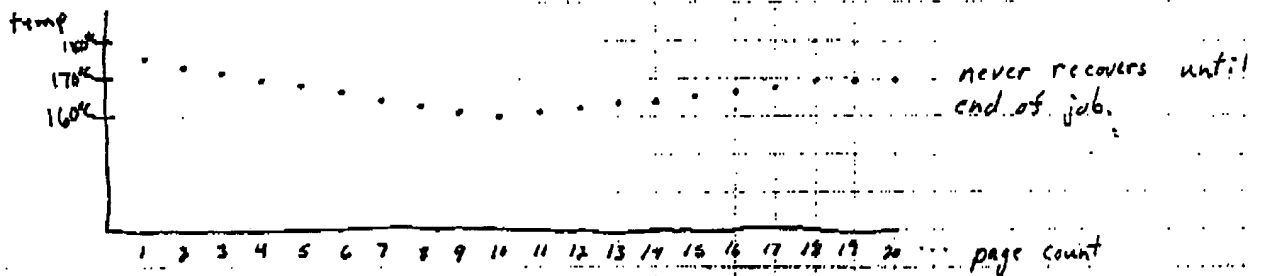
BOOK No.

TITLE

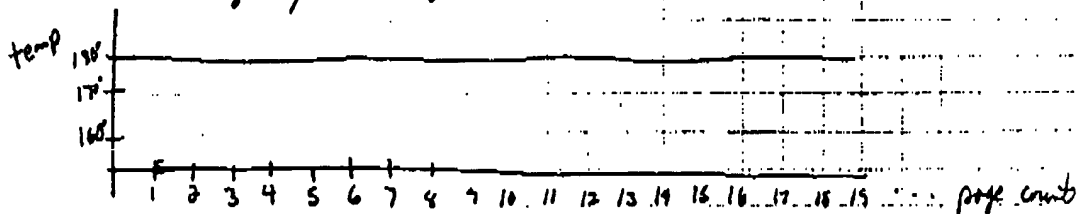
From Page No. 37

Experiments show some additional important benefits. These are: very quick response to thermal loads as well good ride through of sustained thermal loading. Additionally there is no decrease in the gloss of fixed toner from one page to the next. The temperature of the fusing system recovers instantly ~~at~~ when the thermal load exits the nip of the fusing pressure rollers.

typical The ride through of present system shows considerable sag. ①



Ride through of new system



The sag in the ride through ① causes the gloss of the fixed toner to decrease with every page.

To Page No. 3

Witnessed & Understood by me,

Date

Invented by

Date

Recorded by

Project No. _____

TITLE _____

JOL J. _____

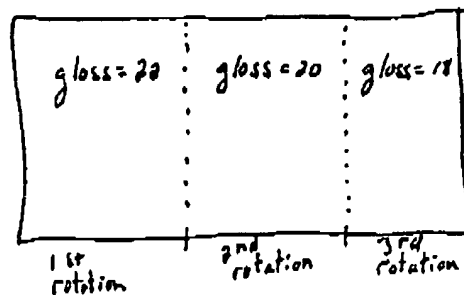
3

From Page No. 39

This system also shows that the teflon coatings and silicon rubber of the pressure rollers can operate reliably at temperatures in excess of 210°C . Tests will be conducted with the surface of the external heating roller at 220°C , 230°C , and 240°C printing 100,000 pages.

as well as many other designs
One problem with this design is that the silicon rubber and teflon coatings are insulators and are poor heat conductors as well as possess a small capacity to store heat energy at the surface. This causes the gloss of the fused toner to decrease over the fused page with each full rotation of the pressure rollers.

- For example for a ledger page the gloss for a solid red secondary color is



Fortunately with the external heater the system recovers for the next page.

To Page No. 4

Witnessed & Understood by me.

Date

Invented by Mark Hunt

Date

Recorded by Mark Hunt

40

Book No. _____

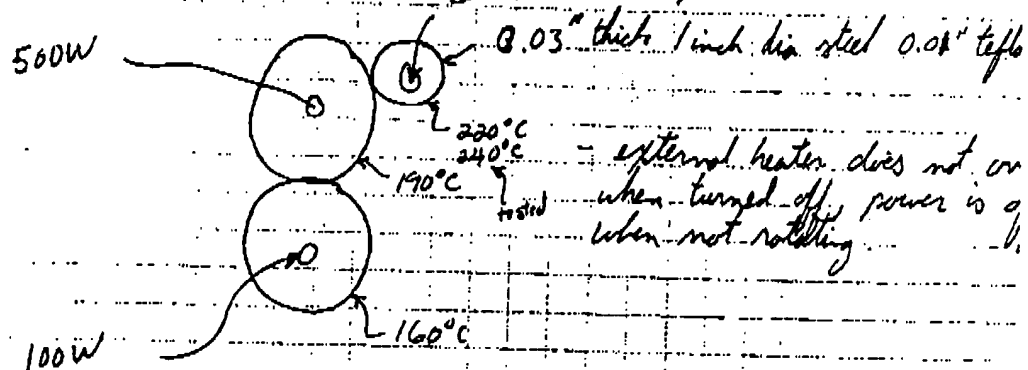
TITLE _____

From Page No. 39

To combat the problem of gloss sag within the page it is necessary to improve the amount of heat that can be carried into the nip of the Suser pressure rollers. A very thin metal layer ^{at} the surface of the upper pressure roller should do the trick. This idea is detailed on page 45 of this note book.

A prototype of this system was built with the following:

System built to test resilience of silicon rubber and teflon to 220°C external h



as of 44,000 pages have been printed on above system with no failures. A second prototype in which the external heater is controlled at 240°C will be constructed.

64,000 pages printed with no problems

240,000 pages printed on two presses with no problems

300,000 pages printed on two presses with no problems

Witnessed & Understood by me,

Date

Invented by

Recorded by

Date

To Page No

ect No. _____

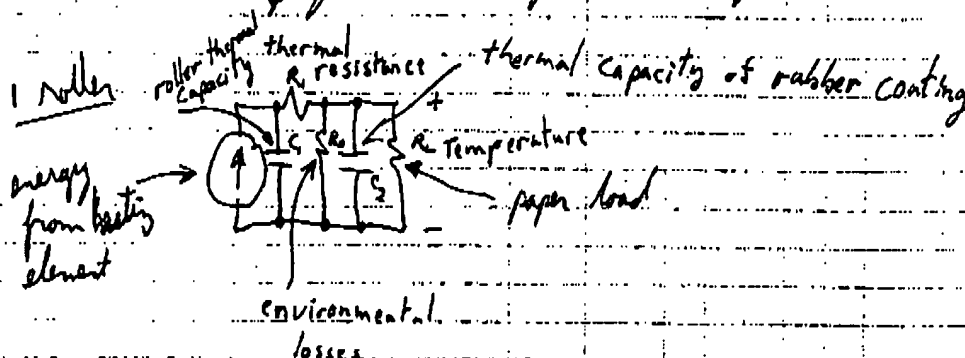
\$000,000.00

TITLE

From Page No.____

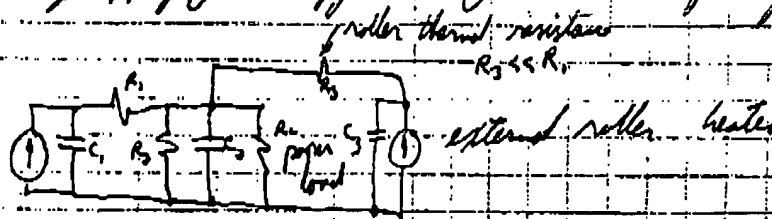
These life tests show no degradation of fuser roller material when heated via contact rolling with 240°C heating roller. This is a 3X life test on two different fusers.

a thermal model for present system is as follows



the problem is that the high thermal resistance of the coolant surface limits energy transport from the fuel.

The external heating rather significantly decreases the thermal resistance of the system by applying energy directly to the surface of the fuses.



To Page No. 4

Witnessed & Understood by me,

Date _____

Invented by

Date

Recorded by _____

Project No. _____

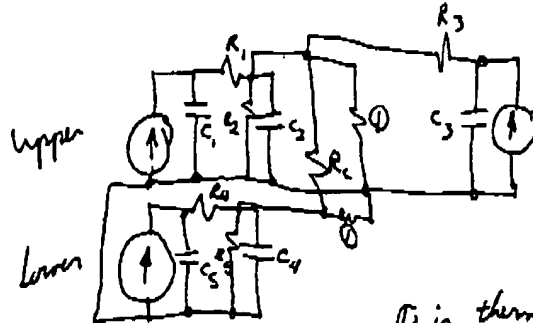
30K 1'

TITLE

42

From Page No. _____

with both rollers
& 1 external heater



external heated roller
against upper roller

C is thermal load of paper as it travels between the finger pressure rollers
 R_c is coupling between upper and lower rollers

Memo HPC-0405-1459-NO2 details temperature comparison experiments.

To Page No. —

Witnessed & Understood by me,

Date

Invented by

Mark Hind

Date

Recorded by _____

Mark Hrus